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CYNOGNATHUS

Wolf-sized *Cynognathus* was a reptile that looked just like a mammal.

Living just before the first dinosaurs roamed the Earth, *Cynognathus* was a therapsid. Reptiles in this group lived in the Triassic Period and were like mammals in many ways.

CAT'S WHISKERS

Modern mammals, like dogs and cats, have whiskers on each side of their face. These help them to sense movements in the air and to feel objects. Each whisker has a small blood vessel and nerve at its root and the whiskers go through special holes in the bones of the animal's snout.

HAIR TOO

As similar special holes or openings were found in *Cynognathus'* skull, experts believe it also had whiskers. Whiskers are just a special kind of sensitive hair. So, if *Cynognathus* had whiskers, it may also have had a thin covering of hair or fur over its tough, leathery skin.

AIR FLOW

Warm-blooded animals need a constant flow of air to their lungs. They cannot stop breathing every time they eat. But reptiles usually take gulps of air in between mouthfuls of food – just as you would have to do, if you did not have a nose!

MAMMAL NOSE

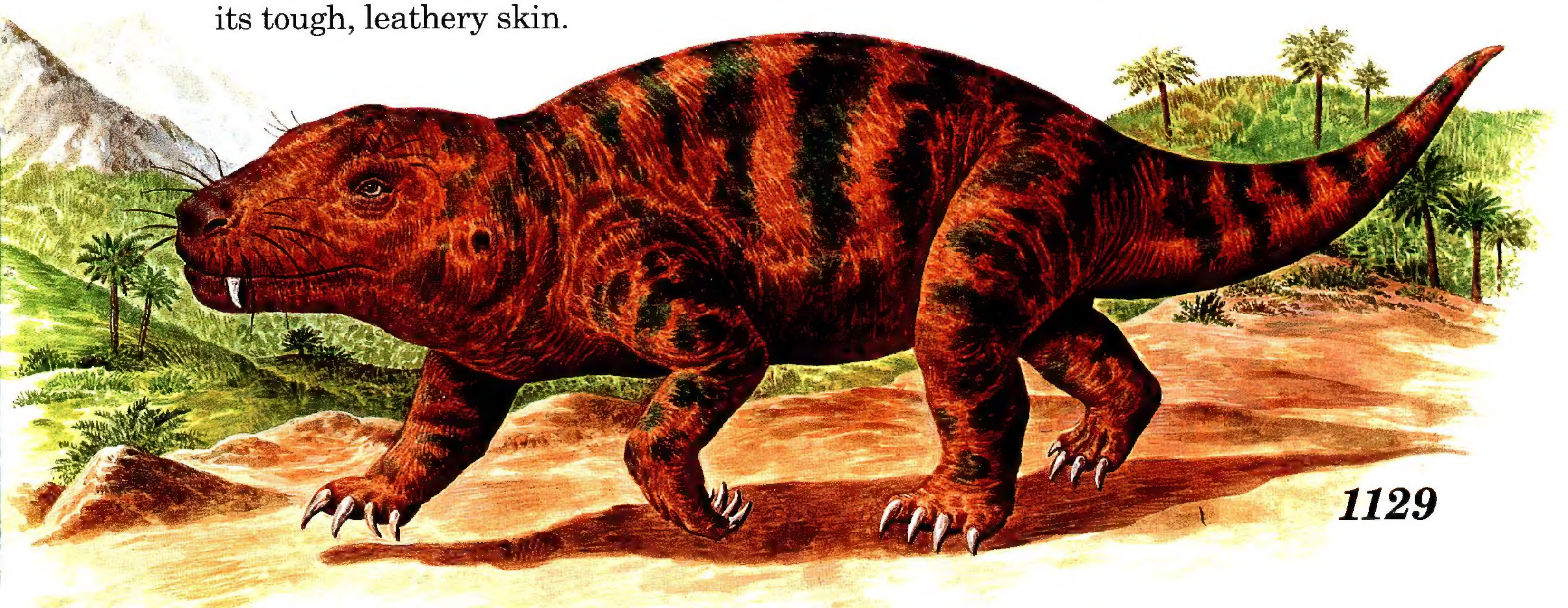
Cynognathus had two, separate passages – one leading from its nose and one from its mouth – so that it could eat and breathe at the same time, just like a mammal.

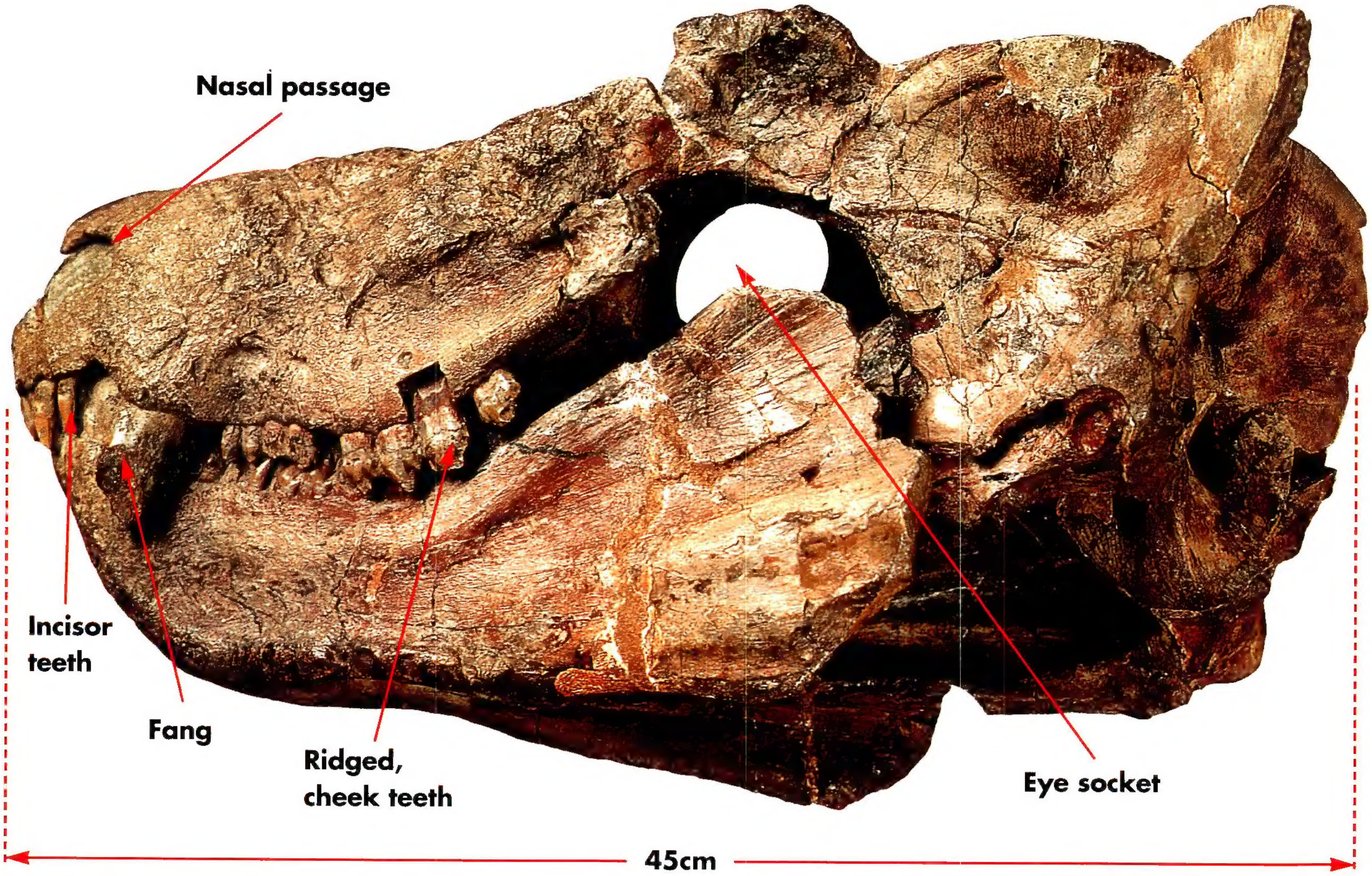
SPEEDY HUNTER

Like a modern wolf, *Cynognathus* was an active meat-eating predator. It could move quickly when hunting prey. Unlike some other, slower reptiles, its limbs did not bend outwards, but were tucked in underneath its body.

ELBOWS AND KNEES

The 'elbows' of *Cynognathus* bent backwards and the 'knees' were flexed forwards like a dog's legs. This made the reptile a speedy runner.





***Cynognathus* was a reptile. But it had a mammal-like skull and teeth. It may even have had whiskers and hair like a dog.**

SHORT LEGS, FLAT FEET

Although it was quite agile, short-legged *Cynognathus* could not compete with the graceful strides of an Alsatian dog of today. Modern dogs run on their toes, but *Cynognathus'* clawed feet lay flat when they hit the ground.

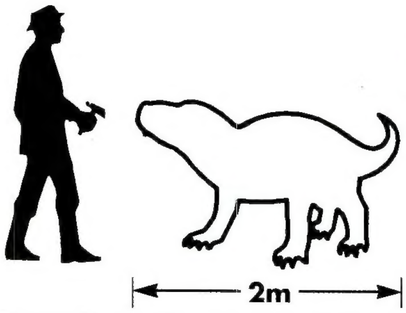
STRONG JAWS

Cynognathus had a long skull which was attached to its jaws by strong muscles. As its mouth opened and closed around its prey, *Cynognathus* could hold on tightly to the trapped, wriggling creature. Its powerful jaws were also useful for tearing apart the flesh of dead victims.

MONSTER FACTS

- **NAME:** *Cynognathus* (sy-nog-nay-thus) means 'dog jaw'
- **GROUP:** reptile
- **SIZE:** up to 2m long
- **FOOD:** meat
- **LIVED:** about 230 million years ago in the Early to Mid Triassic Period in Argentina and South Africa

SIZE WISE



What is? A MAMMAL-LIKE REPTILE

This is one of two types of reptile in a particular group. The earliest of these reptiles were the pelycosaurs (basin-shaped lizards) which existed about 280–250 million years ago. Later, the therapsids, or 'mammal arched' reptiles (the 'arch' refers to the shape of their skulls) evolved. Some therapsids, like *Cynognathus*, were warm-blooded, with body hair and mammal-like teeth.

TYPES OF TEETH

Inside its jaws, *Cynognathus* had different types of teeth, like a mammal. At the front of its mouth were incisors which *Cynognathus* used for nipping and biting.

FEROCIOUS FANGS

Just behind its incisors, *Cynognathus* had a pair of sharp canine teeth, or fangs, which pierced the flesh of its prey. A small gap separated the fangs from a row of big cheek teeth at the back.

FAST EATER

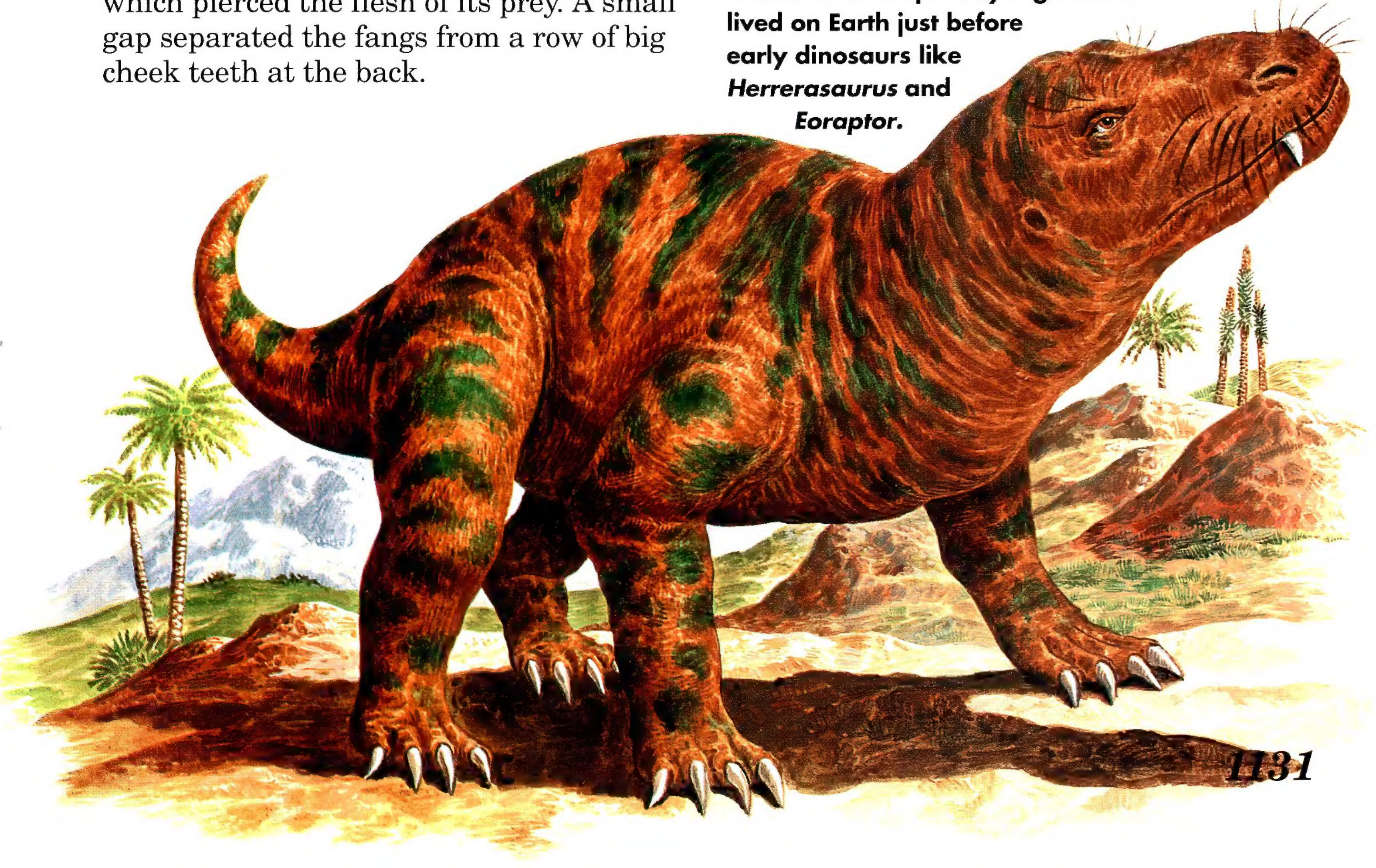
Unlike you, *Cynognathus* was able to gobble down its food quickly, without getting a stomach ache. Using its ridged cheek teeth, it sliced food into smaller chunks and chewed them swiftly. This made the meal easy and quick to digest.

LONG AND LOW

Cynognathus probably lived all over the world, but the best fossils have been found in the ancient rocks of South Africa. Experts believe it grew up to 2m in length but would have stood no higher than an adult human's knee.

LAND SURVIVOR

When some reptiles, such as plesiosaurs and pterosaurs, took to the air or the sea 200 million years ago, warm-blooded *Cynognathus* survived on land. It was a close relative of the true mammals that evolved millions of years later.

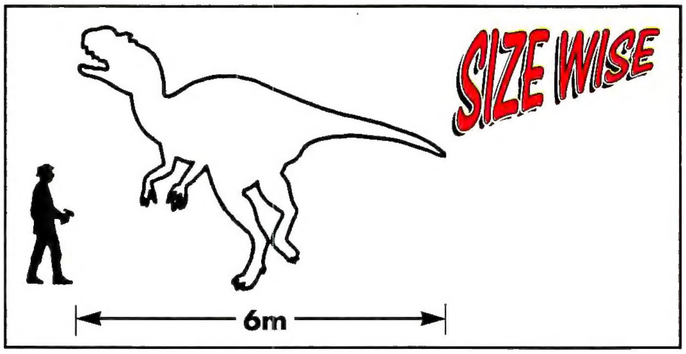


Mammal-like reptile *Cynognathus* lived on Earth just before early dinosaurs like *Herrerasaurus* and *Eoraptor*.

YANGCHUANOSAURUS

***Yangchuanosaurus* was a fierce flesh-eater, as long as an elephant and as heavy as a rhinoceros.**

During the late 1970s, an almost complete skeleton of this predatory dinosaur was discovered. Only an arm, a foot and part of the tail were missing. Like its relative, *Allosaurus*, *Yangchuanosaurus* had a huge head and immense jaws.

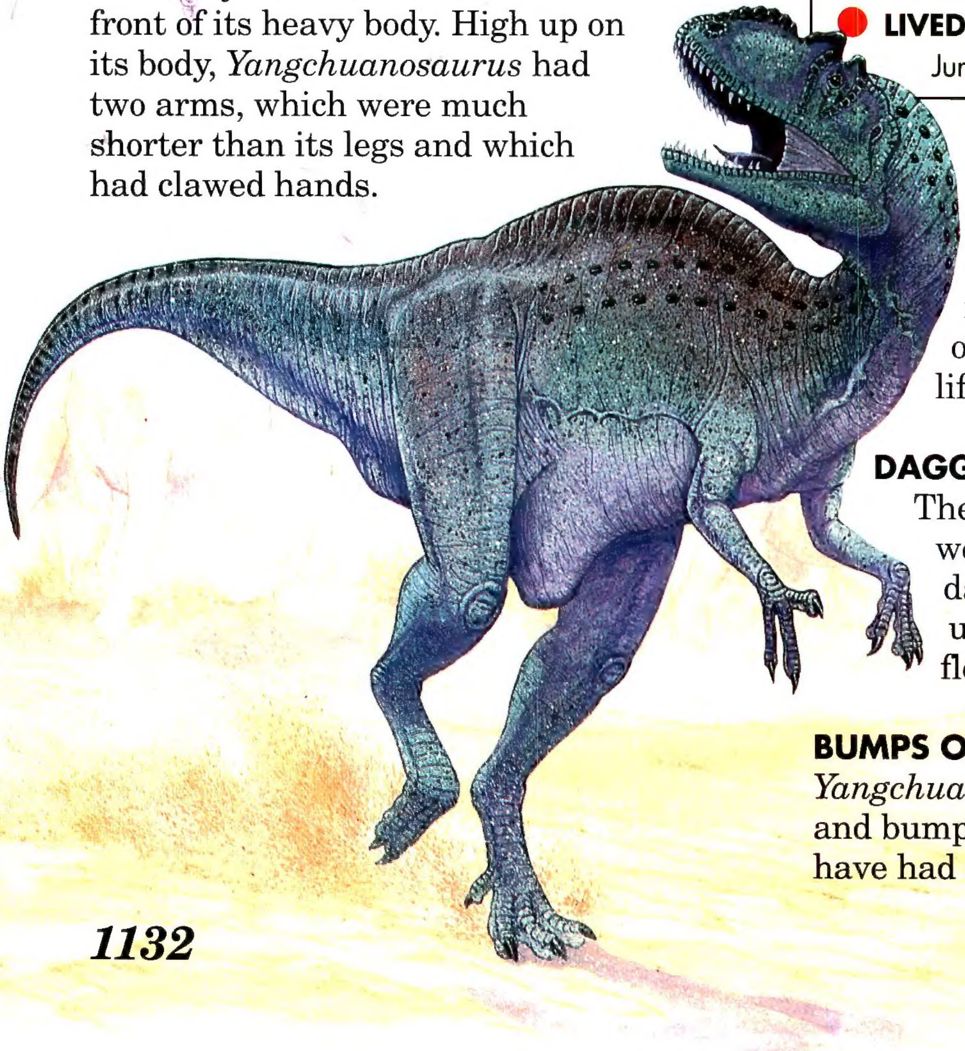


MONSTER FACTS

- **NAME:** *Yangchuanosaurus* (yang-choo-wan-oh-saw-rus) means 'Yangchuan reptile'
- **GROUP:** dinosaur
- **SIZE:** up to 6m long
- **FOOD:** meat
- **LIVED:** about 150 million years ago in the Late Jurassic Period in Yangchuan, China

SHORT ARMS

As *Yangchuanosaurus* strode along on its two powerful legs, it sank its long toe claws into the ground. Its broad, deep tail stood out stiffly behind to balance the front of its heavy body. High up on its body, *Yangchuanosaurus* had two arms, which were much shorter than its legs and which had clawed hands.



MIGHTY LIGHT

Yangchuanosaurus' huge head was not heavy. Its skull was made up of a light framework of bones so the dinosaur could lift and move its head easily.

DAGGER-LIKE FANGS

The vast jaws of *Yangchuanosaurus* were lined with a deadly array of dagger-like fangs. The dinosaur used these fangs to rip open the flesh of its prey.

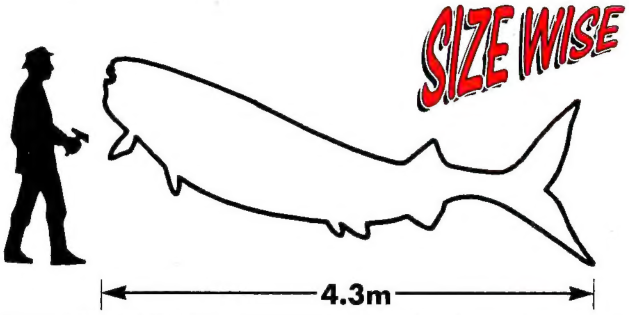
BUMPS ON THE HEAD

Yangchuanosaurus had little lumps and bumps on its head. It may also have had a small crest on its skull.

XIPHACTINUS

***Xiphactinus* was an enormous fish with the instincts of a cannibal!**

When a fossil skeleton of *Xiphactinus* was found in Texas, USA, it revealed the remains of the giant fish's last meal. *Xiphactinus* appeared to have eaten one of its smaller relatives! Both the fish were teleosts, a group that includes most of today's bony fishes.



MONSTER FACTS

- **NAME:** *Xiphactinus* (zy-fak-tin-us) means 'sword-fin'
- **GROUP:** fishes
- **SIZE:** about 4.3m long
- **FOOD:** smaller fish and marine creatures
- **LIVED:** about 100 million years ago in the Cretaceous Period, in the sea that covered the southwest and south of the USA

BONY RAYS

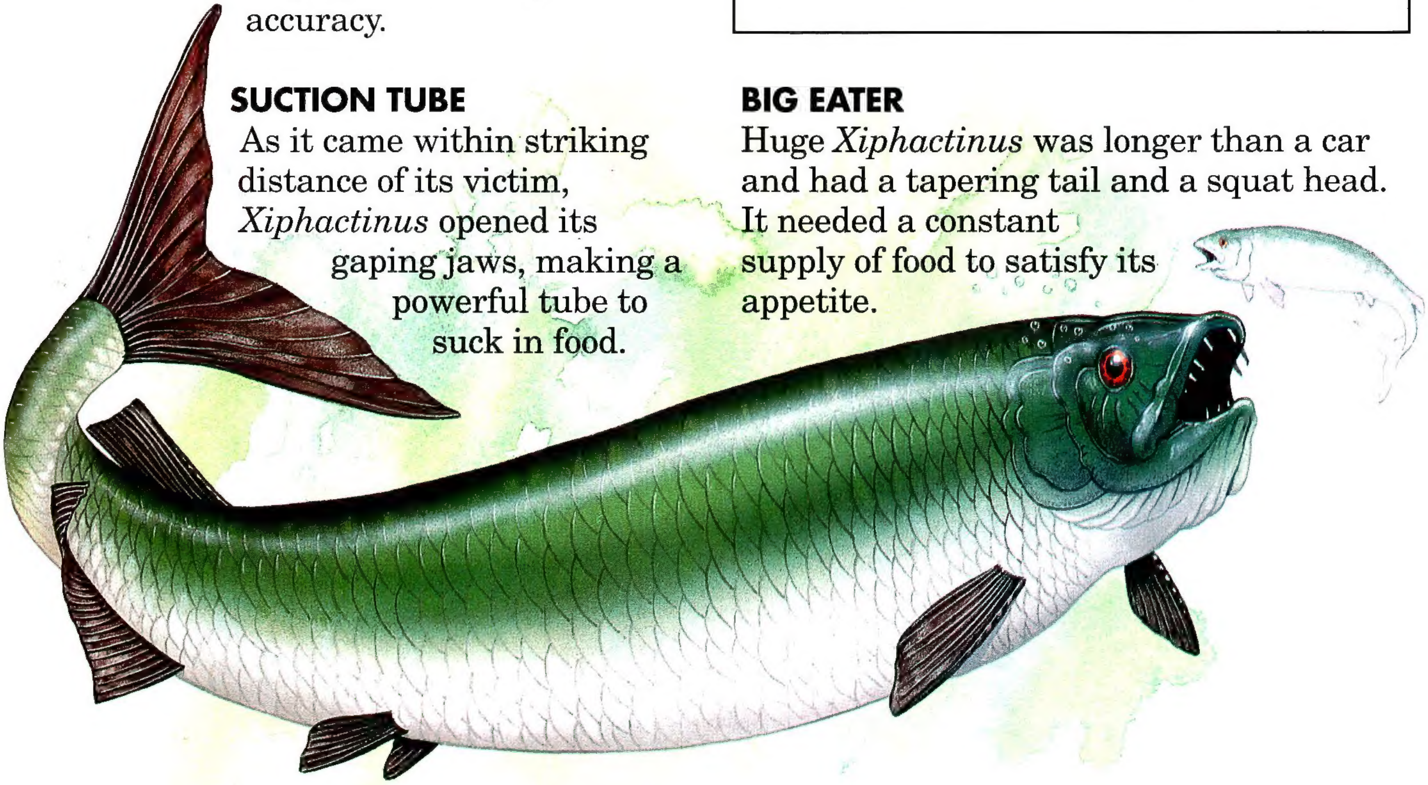
Xiphactinus was a ray-fin. It had straight, bony rays which jutted out from its body and linked up with its fins to support them. As it swam, *Xiphactinus* used its fins to control the movements of its large body. It cut through the water in pursuit of its prey with deadly accuracy.

SUCTION TUBE

As it came within striking distance of its victim, *Xiphactinus* opened its gaping jaws, making a powerful tube to suck in food.

BIG EATER

Huge *Xiphactinus* was longer than a car and had a tapering tail and a squat head. It needed a constant supply of food to satisfy its appetite.



Giant birds and mammals take over

About 66 million years ago, dinosaurs died out along with many other reptiles, sea creatures and various kinds of plants.

This huge change in life on Earth marked the end of the Cretaceous Period and the start of the Tertiary Period. But the world was not deserted once the dinosaurs had gone.

NOT SO EMPTY

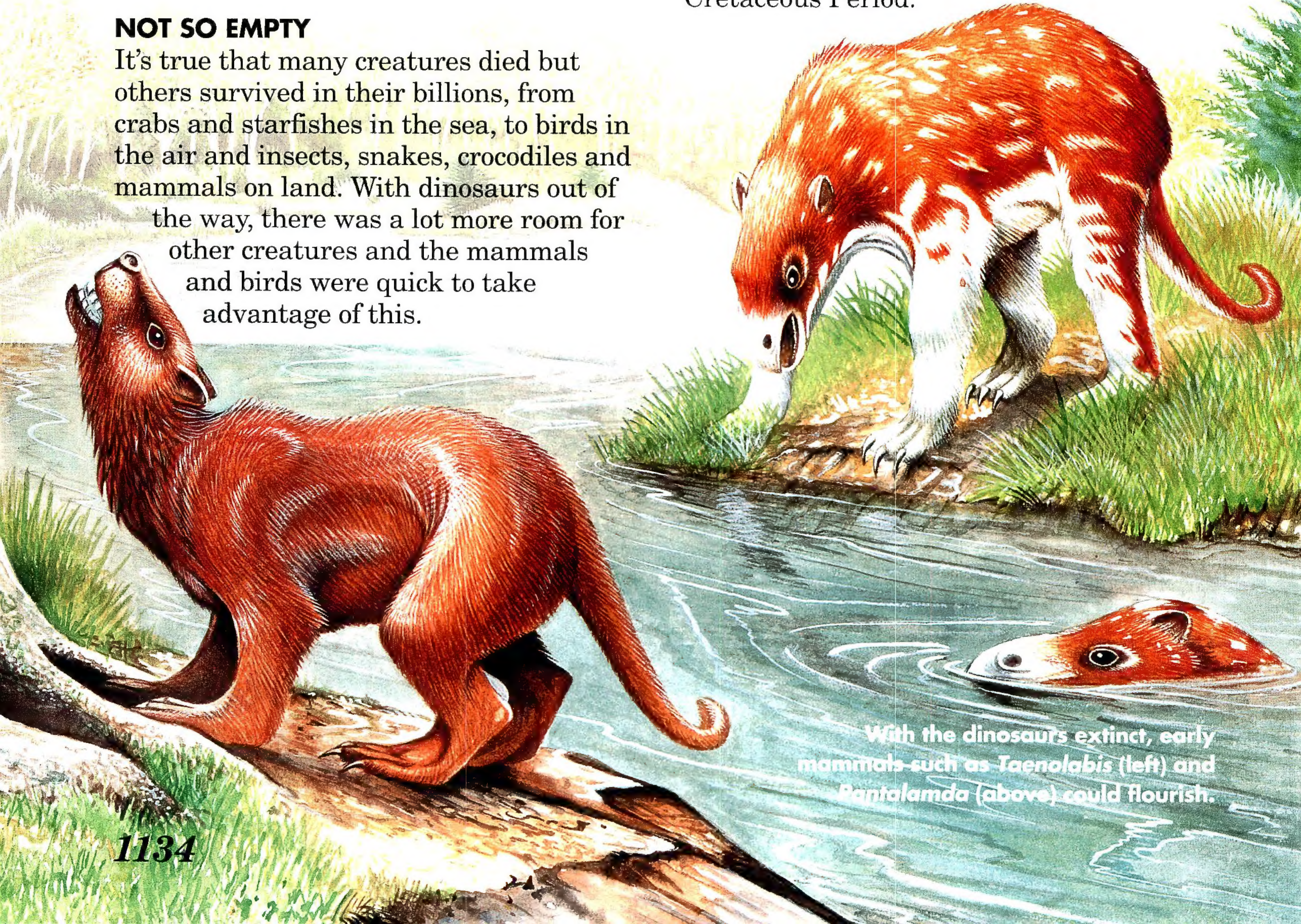
It's true that many creatures died but others survived in their billions, from crabs and starfishes in the sea, to birds in the air and insects, snakes, crocodiles and mammals on land. With dinosaurs out of the way, there was a lot more room for other creatures and the mammals and birds were quick to take advantage of this.

FEW FOSSILS

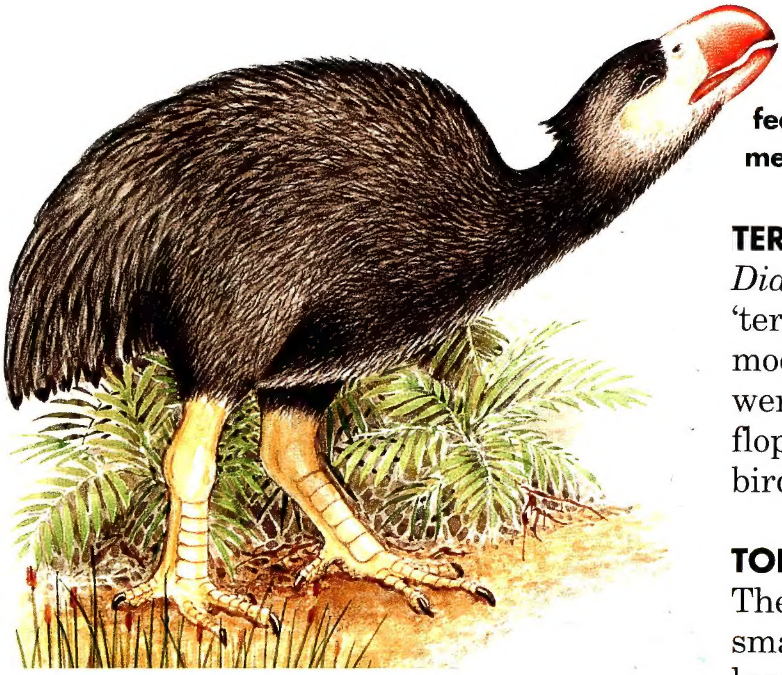
Finding out about prehistoric birds is not easy. Most bird bones are very light and fragile, to save weight for the flying way of life. Because these bones are so delicate, bird fossils are rare.

LIVING TOGETHER

The fossils found so far show that various birds, such as *Hesperornis* and *Ichthyornis*, lived alongside the dinosaurs in the Late Cretaceous Period.



With the dinosaurs extinct, early mammals such as *Taenolabis* (left) and *Pantalamda* (above) could flourish.



The 'terror crane' *Diatryma* (left) was a fearsome prehistoric bird. This giant creature measured up to 2m tall.

THE BIG BIRDS

After the great extinction at the end of the Cretaceous Period, some birds found a new way of life. They became enormous and they stayed on the ground. They were runners not fliers and, in a way, filled the place of certain dinosaurs. One of these feathered giants was *Diatryma* – a huge, flightless bird that stalked North and South America some 50 million years ago.

IT'S A FACT

FRIENDLY FEATHERED MONSTERS!

Some huge birds survived until only a few hundred years ago, but they were not hunters like *Diatryma* and *Phororhacos*. They fed on plants, fruit and small creatures like insects. These giants included the elephant bird *Aepyornis* of Madagascar – which was 3m high – and the giant moa *Dinornis* of New Zealand which was a whopping 3.5m!

TERROR CRANE

Diatryma was 2m tall and nicknamed the 'terror crane'! It had a huge beak, like a modern parrot's but much bigger. Its wings were small and the feathers were fine and floppy, similar to those of today's flightless birds, such as the cassowary or kiwi.

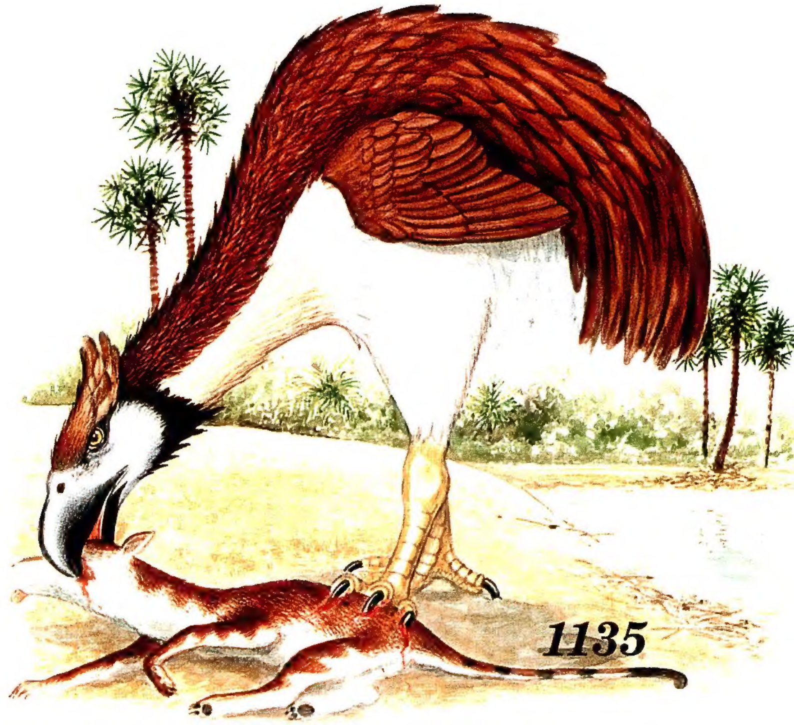
TORN TO PIECES

The enormous *Diatryma* probably chased smaller animals, running after them on its long, strong back legs. Having caught its victim, *Diatryma* may have pinned it to the ground with the three large claws on each foot and attacked it with its vicious beak.

MORE FEATHERED GIANTS

About 20 million years ago, *Phororhacos* prowled Patagonia, in South America. It was another giant hunting bird. It had tiny, useless wings and an eagle-like beak.

***Phororhacos* (below) was a giant, flightless bird and a ruthless predator on land. Once it caught its prey, it would use its hooked, eagle-like beak to tear off the flesh.**



ENTER THE MAMMALS

The big birds were not the only creatures to flourish once the dinosaurs died out. By the beginning of the Tertiary Period, there were already lots of types of mammals, though hardly any were bigger than a dog.

WEIRD AND WONDERFUL

With the dinosaurs and many other animals gone, mammals suddenly started to evolve into all manner of weird and wonderful beasts. This evolution continued into the Eocene Epoch and produced some of the strangest mammals ever.

THE PREDATORS

One new mammal group was the creodonts ('meat-eating tooth'). *Patriofelis*, for example, looked like a modern leopard and was ideally built for killing prey. *Sinopa* was a creodont about the size of a fox. Its blade-like teeth were adapted for slicing meat.

AN EARLY PRIMATE?

Fossils of *Plesiadapis*, found in Crazy Mountain Basin, Montana, USA, show it was a creature similar to today's lemurs, and could have scampered through trees. Some scientists believe it was an early member of our own mammal group, the primates.

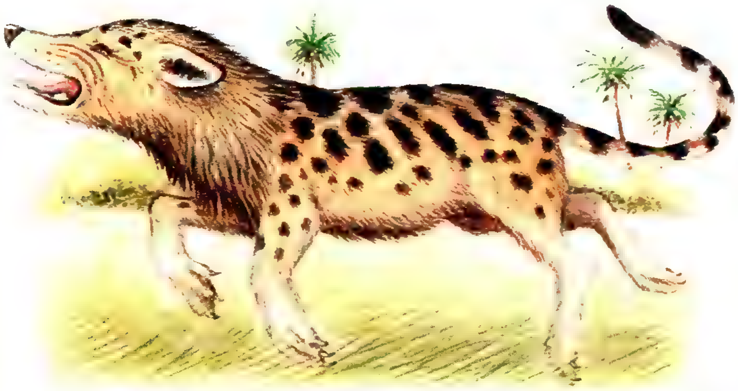
THE BEAR TRUTH

Anagalids were small plant-eaters that probably looked like rabbits. They had broad back teeth for crushing plants. *Titanoides* was a much bigger bear-like creature, from the pantodont group. It was probably an omnivore.

Many early mammals looked similar to modern ones. *Patriofelis* (above) looked quite like a modern leopard. The similarity between prehistoric *Titanoides* (below) and a modern bear (right) is obvious.

A WOLF-LIKE PREDATOR

Mesonyx was a fast-running, wolf-sized creature with pointed molar teeth that could cut flesh and shear bone. But although it was a predatory carnivore, *Mesonyx* belonged to a group that includes today's horses and deer.



Early mammal *Mesonyx* (above) was a wolf-like creature related to horses.

THE FIRST BIG MAMMAL

The first really large mammal was *Uintatherium*, which roamed the plains of Utah, USA, in the Late Paleocene and Early Eocene Epochs. It was about the size of today's rhinoceros, with a body 3.5m long. It had six bony knobs on its face and broad cheek teeth for chewing plant food.

TEETH FOR FIGHTING

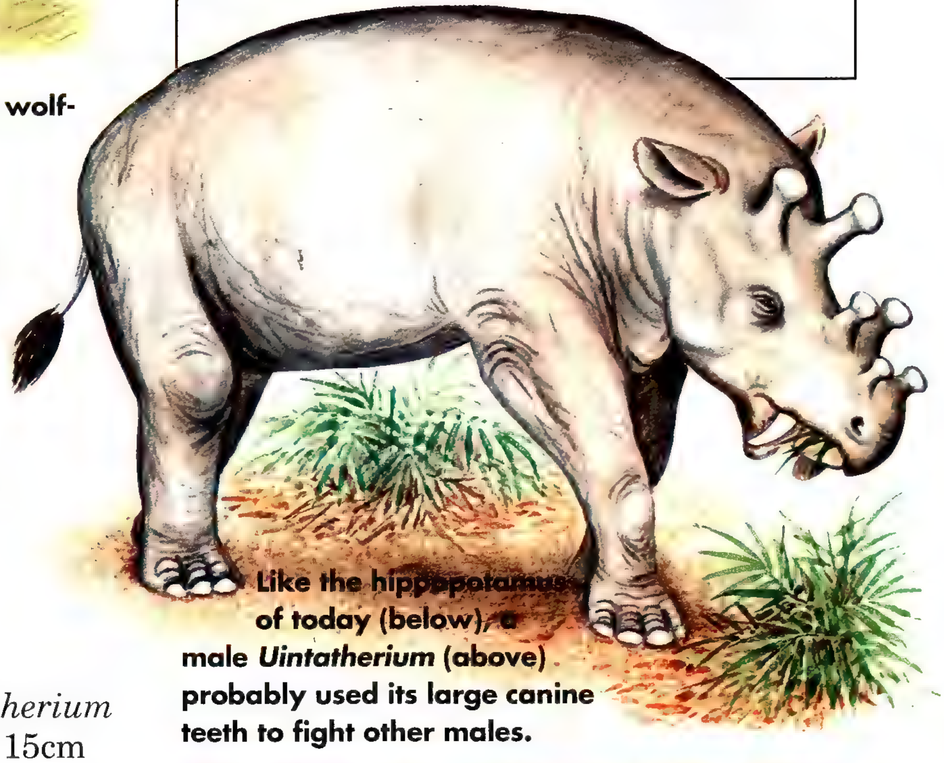
It is thought that only male *Uintatherium* had the large canine teeth – about 15cm long. They may have used these teeth to fight each other for females and territories, like today's hippopotamuses.

THE AGE OF MAMMALS

By the middle of the Eocene Epoch, 45 million years ago, the mammals were the most important animals on land. Some, such as bats, were taking to the air. Others, such as whales, swam in the seas.

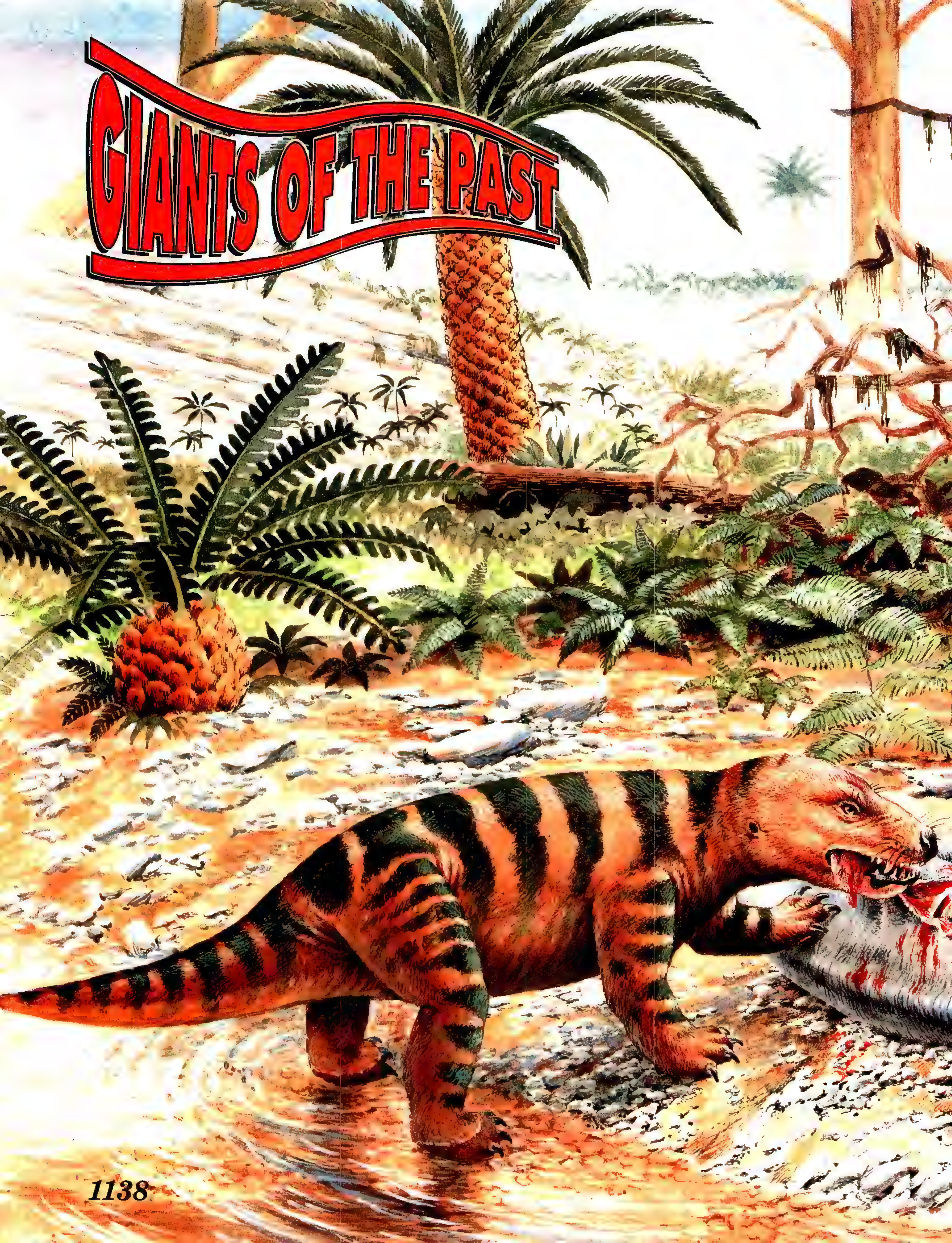
Is it true that mammal evolution 'exploded' after dinosaurs?

Yes. There was a huge increase in the numbers and types of mammals, after the mass extinction of 66 million years ago. We can see this by looking at the numbers of families (groups) of mammals. At the end of the Cretaceous Period, there were about 10 to 15 mammal families but by the Early Eocene Epoch, this number had risen to nearly 80! It was a spectacular burst of evolution. By the end of the Eocene Epoch, about 38 million years ago, all today's main groups of mammals were walking, flying and swimming on the Earth.

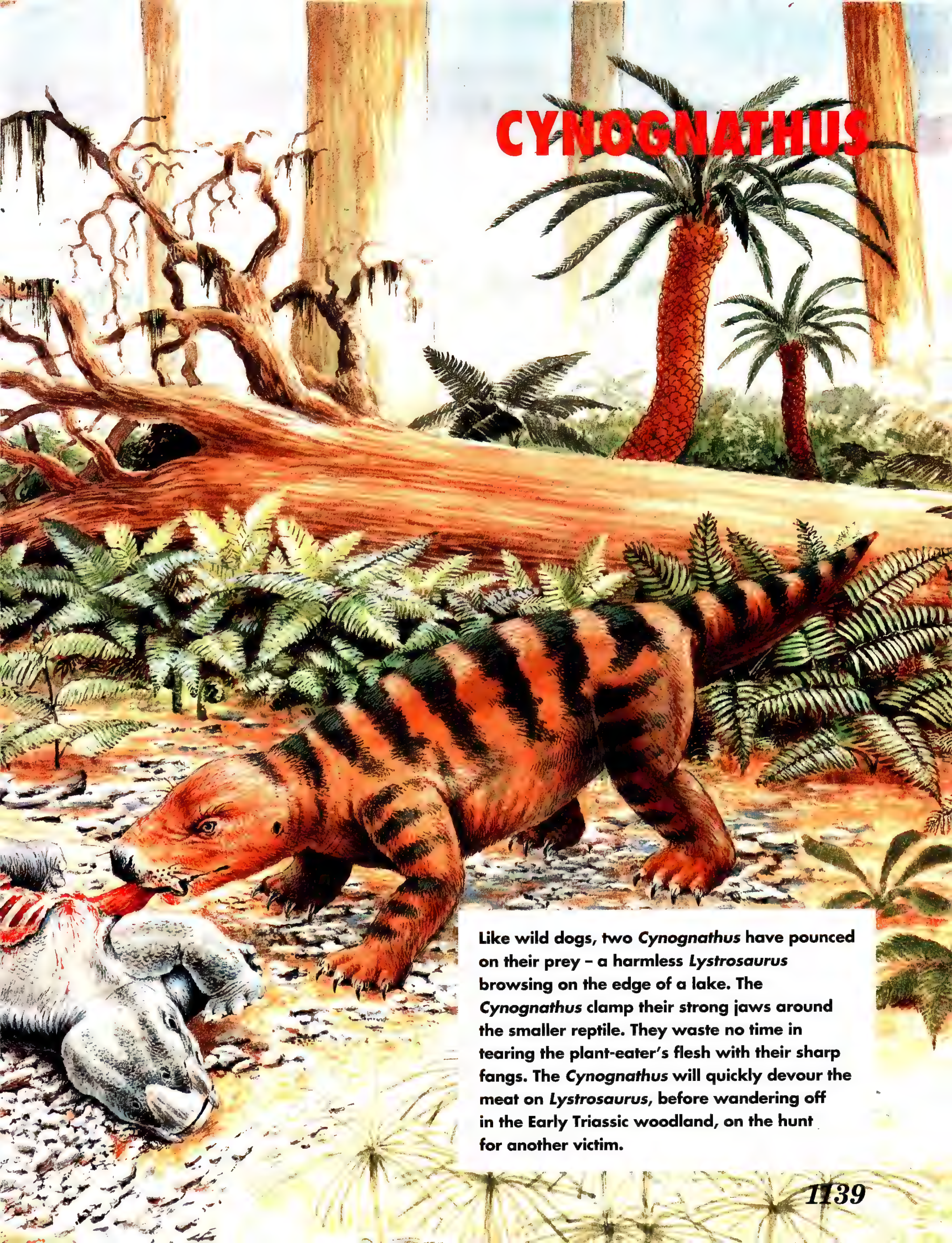


Like the hippopotamus of today (below), a male *Uintatherium* (above) probably used its large canine teeth to fight other males.

GIANTS OF THE PAST



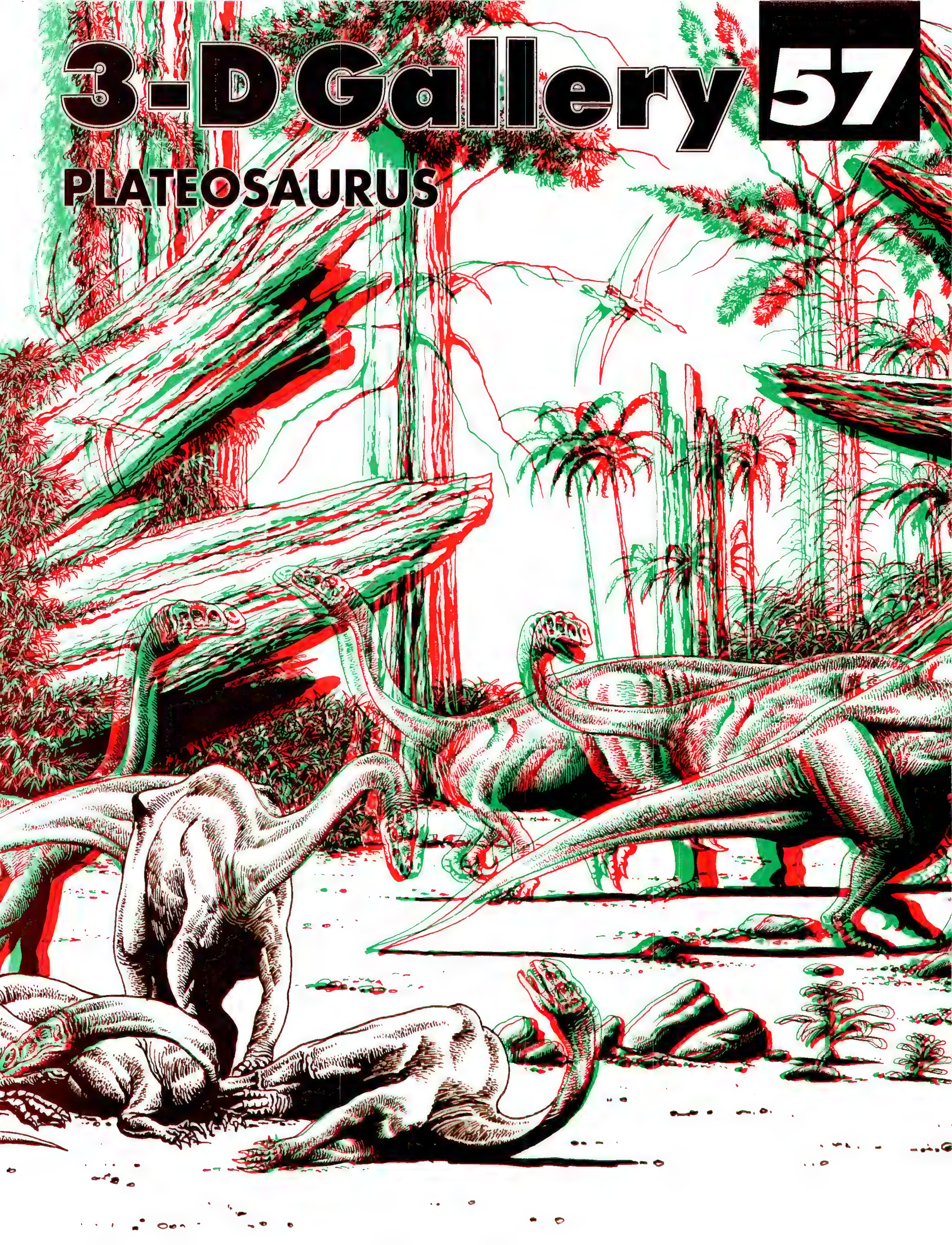
CYNOGNATHUS

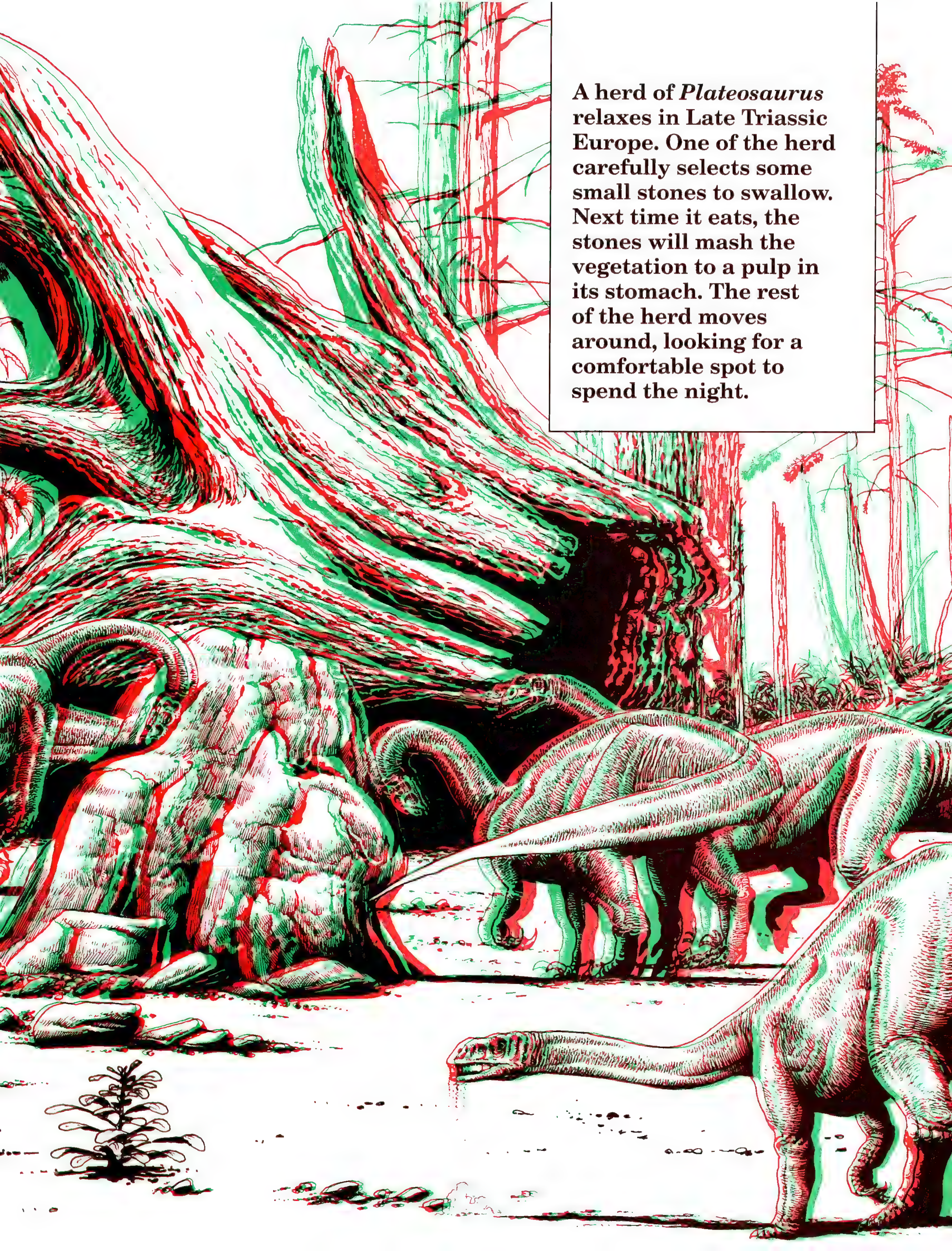


Like wild dogs, two *Cynognathus* have pounced on their prey – a harmless *Lystrosaurus* browsing on the edge of a lake. The *Cynognathus* clamp their strong jaws around the smaller reptile. They waste no time in tearing the plant-eater's flesh with their sharp fangs. The *Cynognathus* will quickly devour the meat on *Lystrosaurus*, before wandering off in the Early Triassic woodland, on the hunt for another victim.

3-D Gallery 57

PLATEOSAURUS





A herd of *Plateosaurus* relaxes in Late Triassic Europe. One of the herd carefully selects some small stones to swallow. Next time it eats, the stones will mash the vegetation to a pulp in its stomach. The rest of the herd moves around, looking for a comfortable spot to spend the night.

Mammal teeth

Biting, stabbing, gripping, cutting, chewing, crunching, grinding and fighting – teeth are very useful tools!

Like mammals today, mammals in prehistoric times had special teeth to deal with different foods. Mammals have three types of teeth – incisors, canines and molars.

TEETH TYPES

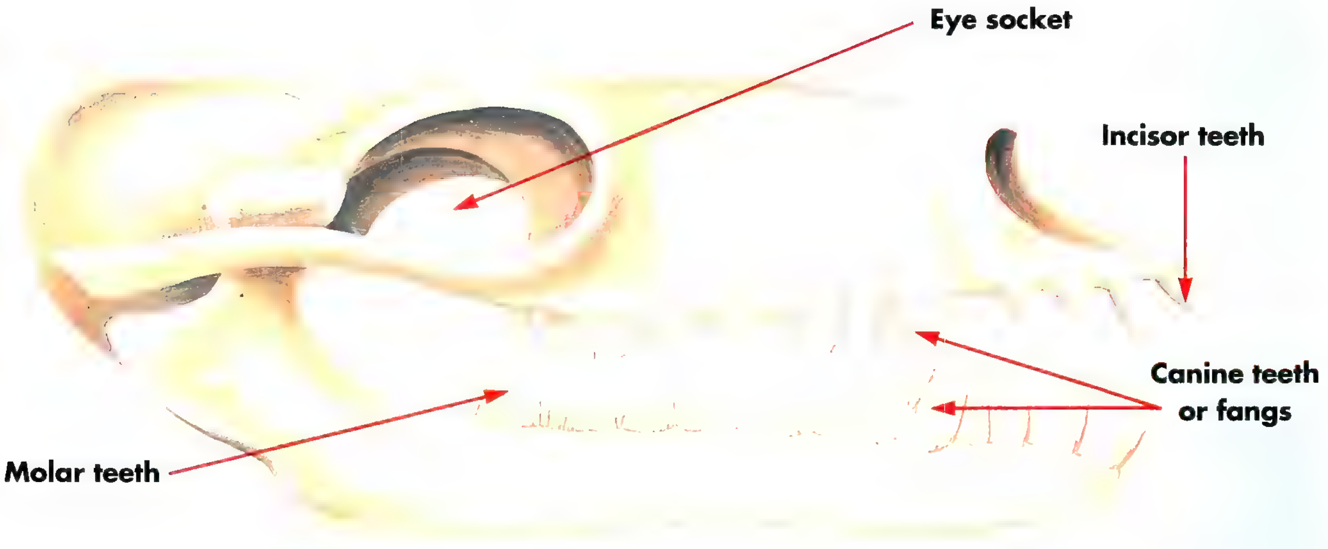
The incisors and canines are at the front of the jaw and the molars are at the back. Incisors have flat sides and a sharp edge for cutting. Canines are pointed and used for stabbing and killing. Molars can be sharp for slicing meat, or blunt for grinding up plants.

Sabre-toothed *Smilodon* (above) had two enormous fangs in its upper jaw.

MEAT OR VEG?

In general, the canines of carnivores are very big, to help them kill their prey. Herbivores have big mouths with long rows of wide molars. The molars are blunt and used for chewing and grinding tough plant food. Mammals are the only animals that can chew.

As this skull shows, different teeth give mammals a tool for every eating job.



CUT THROAT

Two million years ago, a fearsome big cat called *Smilodon* roamed the plains of North America. It had big canines, known as sabre-teeth, which grew up to 20cm long and curved backwards. *Smilodon* may have used these teeth to stab the thick hide of its victims and to cut the arteries in their throats, so they bled to death.

STRONG MOLARS

Hyenas, which first appeared about 20 million years ago, have especially strong molars. They are meat-eating scavengers and need their strong back teeth to break open bones to get at the soft marrow inside.

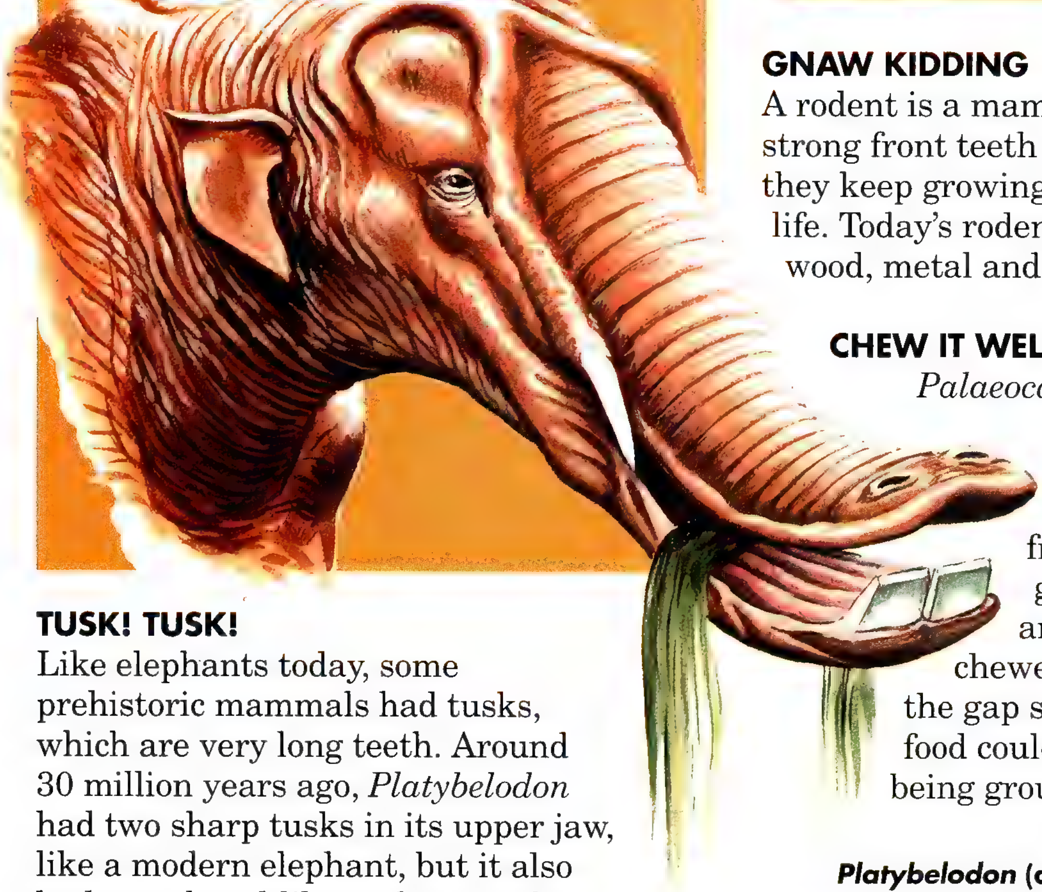
Today's meerkat (right), like prehistoric *Palaeocastor* (left), is a rodent with incisors for gnawing.

GNAW KIDDING

A rodent is a mammal with amazingly strong front teeth which never wear out – they keep growing throughout the animal's life. Today's rodents can gnaw through wood, metal and even glass!

CHEW IT WELL

Palaeocastor was one of the first rodents and looked rather like a beaver. It had strong, chisel-like front teeth and a big gap between its front and back teeth. When it chewed, it drew its lips into the gap so that no bits of sharp food could be swallowed before being ground by the back teeth.



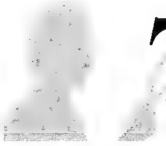
***Platybelodon* (above left) had four very odd-looking tusks. The bottom two were ideal for scooping up plants to eat.**

TUSK! TUSK!

Like elephants today, some prehistoric mammals had tusks, which are very long teeth. Around 30 million years ago, *Platybelodon* had two sharp tusks in its upper jaw, like a modern elephant, but it also had two shovel-like tusks in its lower jaw which it used to scoop up plants.

How animals evolve

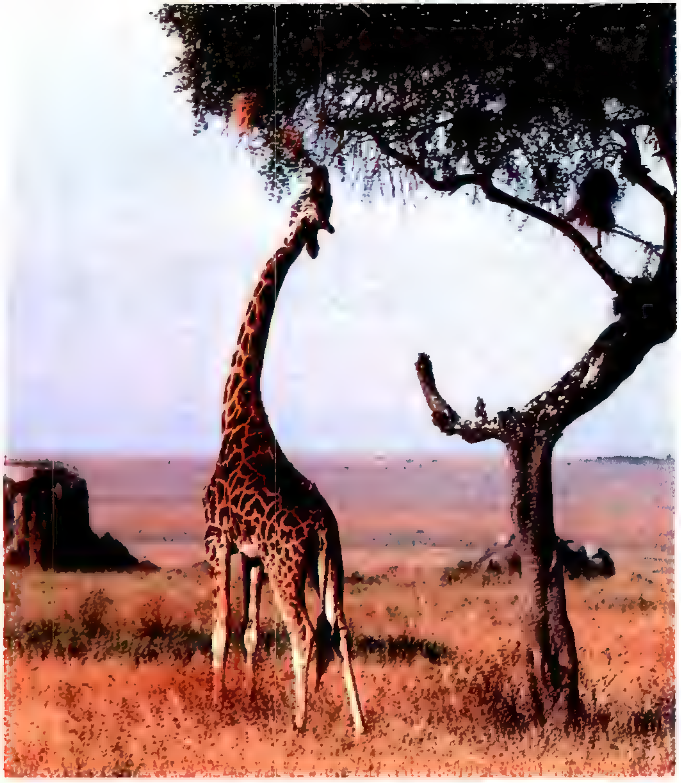
All creatures alive today have developed from prehistoric animals.



The way one kind of animal gradually becomes another is called evolution. Today's gorilla and spider monkey have a single ancestor, prehistoric *Adapis*.

DIFFERENT BODIES

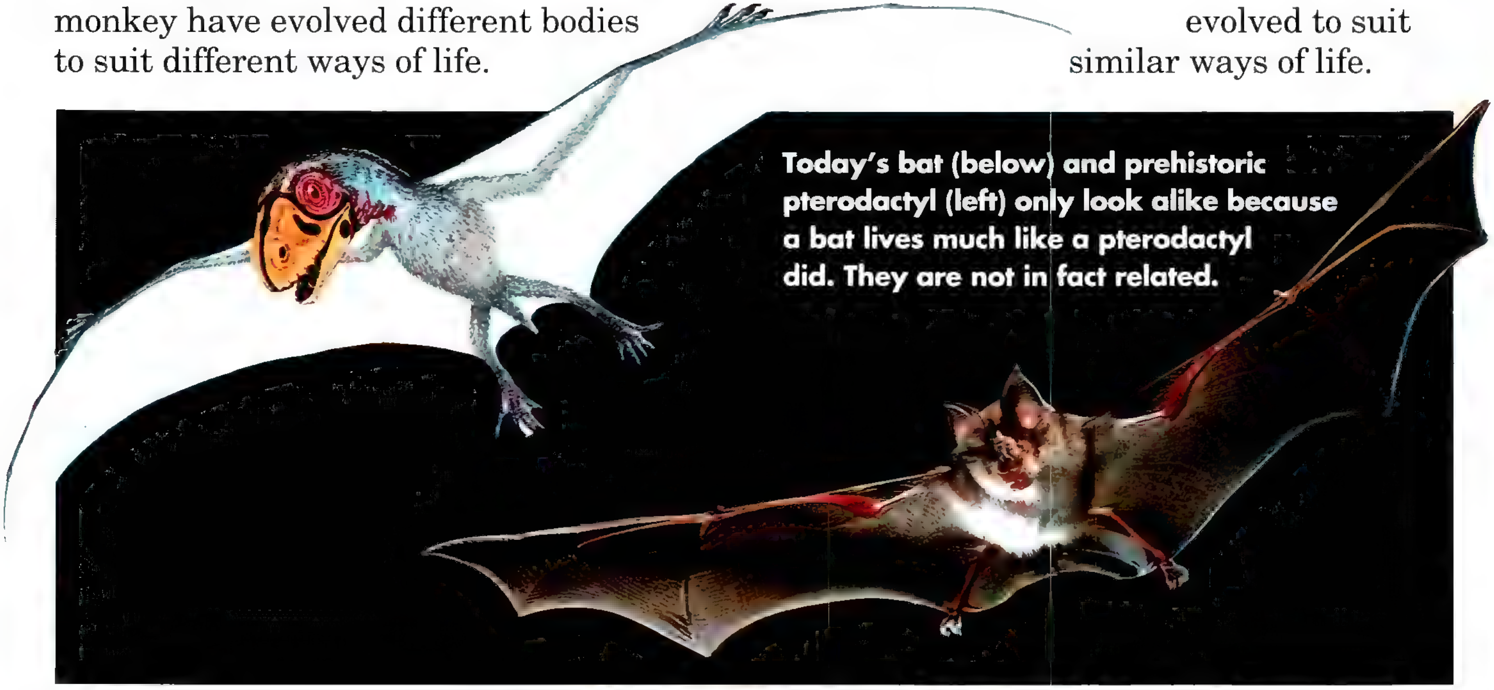
But the gorilla has evolved into a large, heavy animal which lives on the ground in dense jungles. The spider monkey has evolved into a small, agile animal and lives in trees. So, the gorilla and the spider monkey have evolved different bodies to suit different ways of life.



Today's long-necked giraffe can reach the best leaves. Over thousands of years, giraffes have evolved with longer and longer necks.

SIMILAR LIVES

Although the modern bat and the prehistoric pterodactyl look similar, they do not share a common ancestor like the gorilla and spider monkey do. Bats are mammals which still live today, while pterodactyls were reptiles living at the time of the dinosaurs. But, they look similar because they have evolved to suit similar ways of life.



Today's bat (below) and prehistoric pterodactyl (left) only look alike because a bat lives much like a pterodactyl did. They are not in fact related.

SURVIVAL OF THE FITTEST

The British scientist, Charles Darwin, believed that evolution depended on the survival of the fittest. For instance, prehistoric *Craniocerus*, an ancestor of the present-day giraffe, had a short neck. But, just as some of your friends are taller than you, some early giraffes had slightly longer necks than others. They could reach more leaves and feed better, so they had a better chance of surviving and producing young.

FAMILY RESEMBLANCE

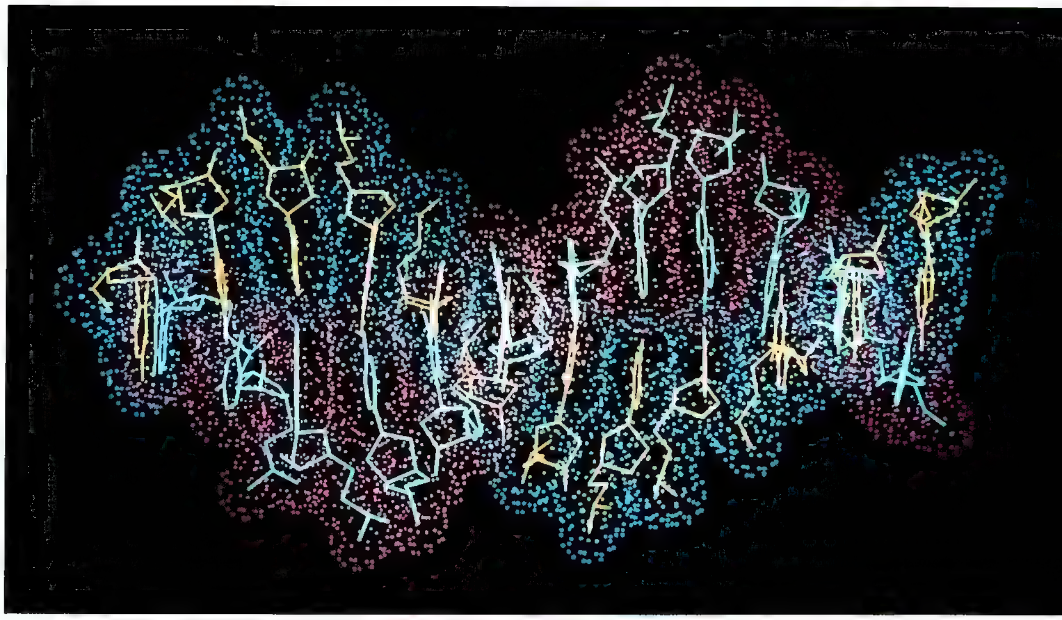
Darwin did not know how animals passed on a characteristic, such as having a long neck, to their young. But scientists now know that all animals have complicated chemicals, called genes, in their bodies. Parents pass these genes on to their baby.

CHANGING GENES

Sometimes a gene will mutate (change) slightly to produce a new feature in the baby – one the adult did not have. If the mutated gene gives an advantage, such as having an even longer neck, the creature with the mutated gene will survive better.

Is it true that hundreds of species of animal and plant die out every single year?

Yes. Tropical rainforests contain more types of insects and plants than anywhere else on Earth. Humans are cutting down the forests so quickly that it is feared that several hundred different kinds of animals and plants are becoming extinct each year.



The genes we get from our parents are carried in the DNA (deoxyribonucleic acid) strands in our bodies. This is a computer image of DNA.

EXTINCT IS FOREVER

Entire groups of animals can die out without leaving any young. The dinosaurs became extinct about 66 million years ago. Groups of animals may die out because the climate changes, the food supply runs out or the animal's habitat is destroyed.

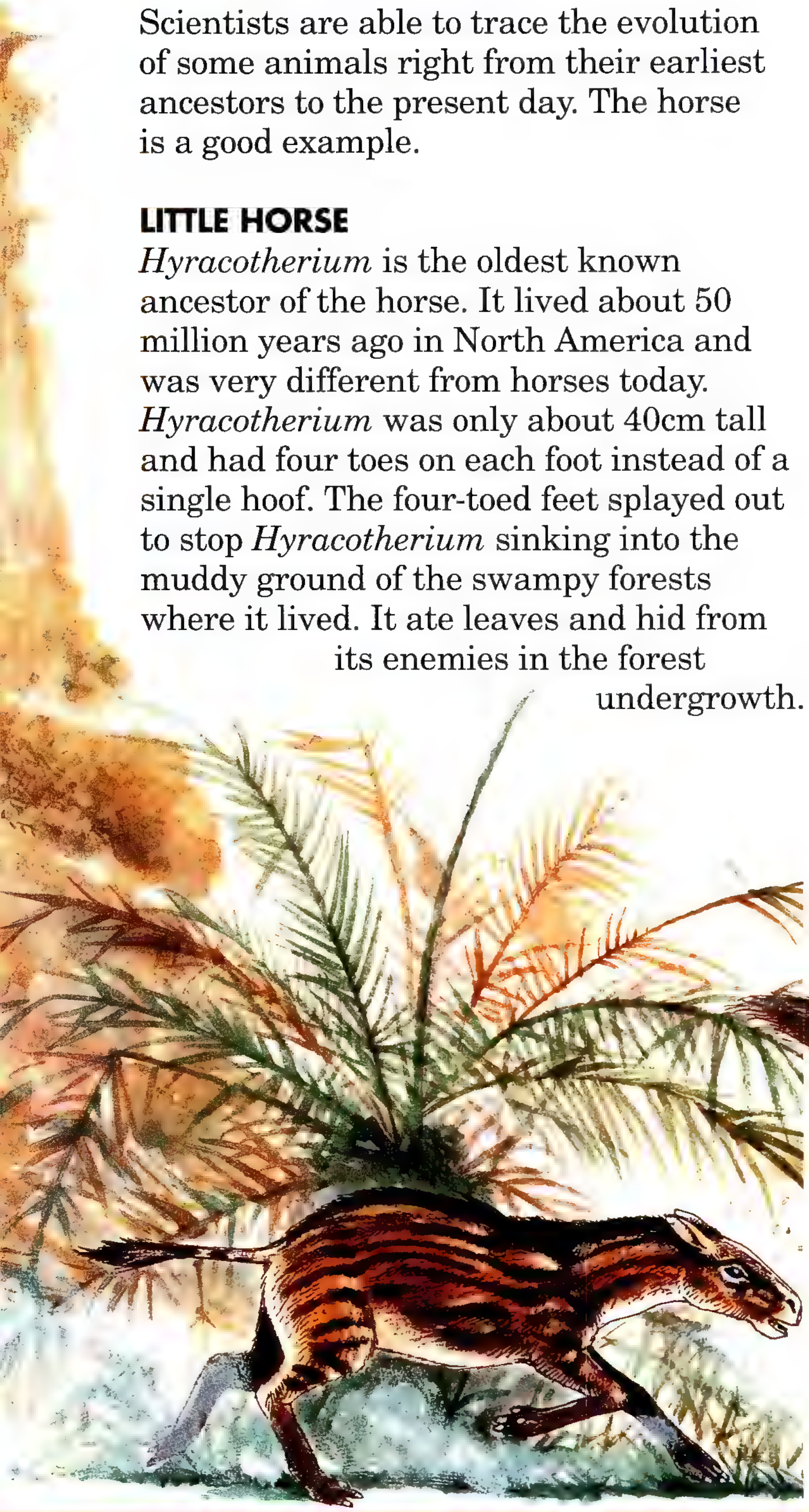
This modern bald eagle died during a harsh winter in Alaska. A change in climate can cause whole species of birds to die out.

EVOLUTION AT WORK

Scientists are able to trace the evolution of some animals right from their earliest ancestors to the present day. The horse is a good example.

LITTLE HORSE

Hyracotherium is the oldest known ancestor of the horse. It lived about 50 million years ago in North America and was very different from horses today. *Hyracotherium* was only about 40cm tall and had four toes on each foot instead of a single hoof. The four-toed feet splayed out to stop *Hyracotherium* sinking into the muddy ground of the swampy forests where it lived. It ate leaves and hid from its enemies in the forest undergrowth.



HYRACOTHERIUM CHECKLIST

- LIVED 50 MILLION YEARS AGO
- HEIGHT 40CM
- FOUR TOES

IT'S A FACT

CHUNKY HORSES?

Some early rhinoceroses were like early horses. Prehistoric rhino *Hyracodon* lived at the same time as the early horse *Merychippus*. It could run quickly and eat grass. If the world had changed differently, evolution could have led to chunky horses which looked more like rhinoceroses!

GETTING FASTER

About 12 million years ago, *Merychippus* lived in North America. It was much more like a modern horse than *Hyracotherium*. *Merychippus* had evolved to live on open grassland and stood 1m tall.

MERYCHIPPUS CHECKLIST

- LIVED 12 MILLION YEARS AGO
- HEIGHT 1M
- THREE TOES, ONE ENLARGED AS A HOOF

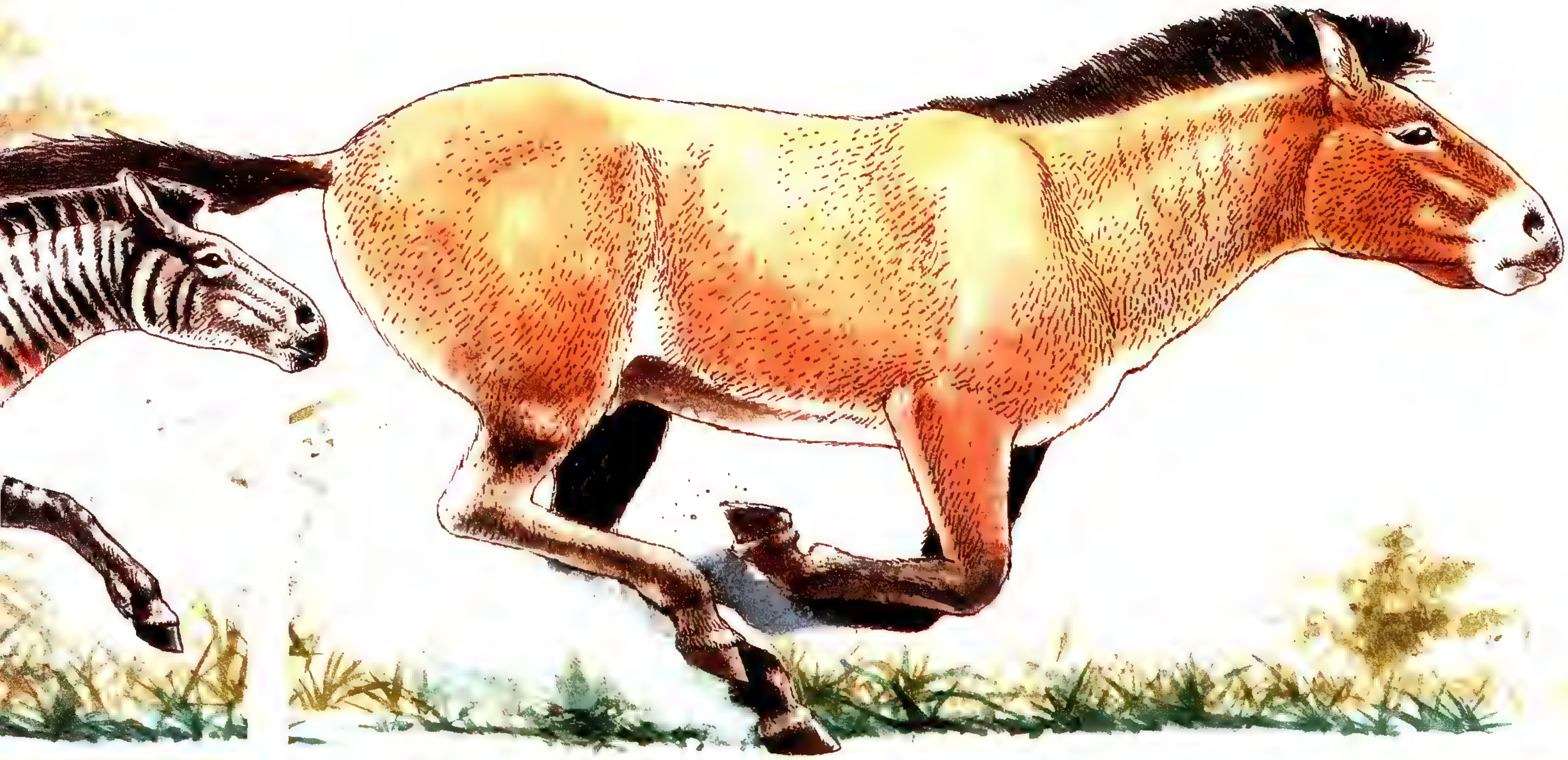
EVOLVING HOOF

Merychippus had long legs and stood only on the central toe of each foot, which was enlarged and looked like a hoof. It could run quickly to escape danger as there was nowhere to hide on open plains. The teeth of *Merychippus* were large and suited to grinding up tough grass stems.

WINNING THE RACE

Equus, the present day horse, first appeared about two million years ago. It is even better adapted for living on grasslands than *Merychippus* was. *Equus* is about 1.5m tall. It has long, muscular legs and all the toes on each foot are fused into one strong hoof. It can run extremely fast to escape from hunters. Humans first caught and trained the wild *Equus* about 5,000 years ago.

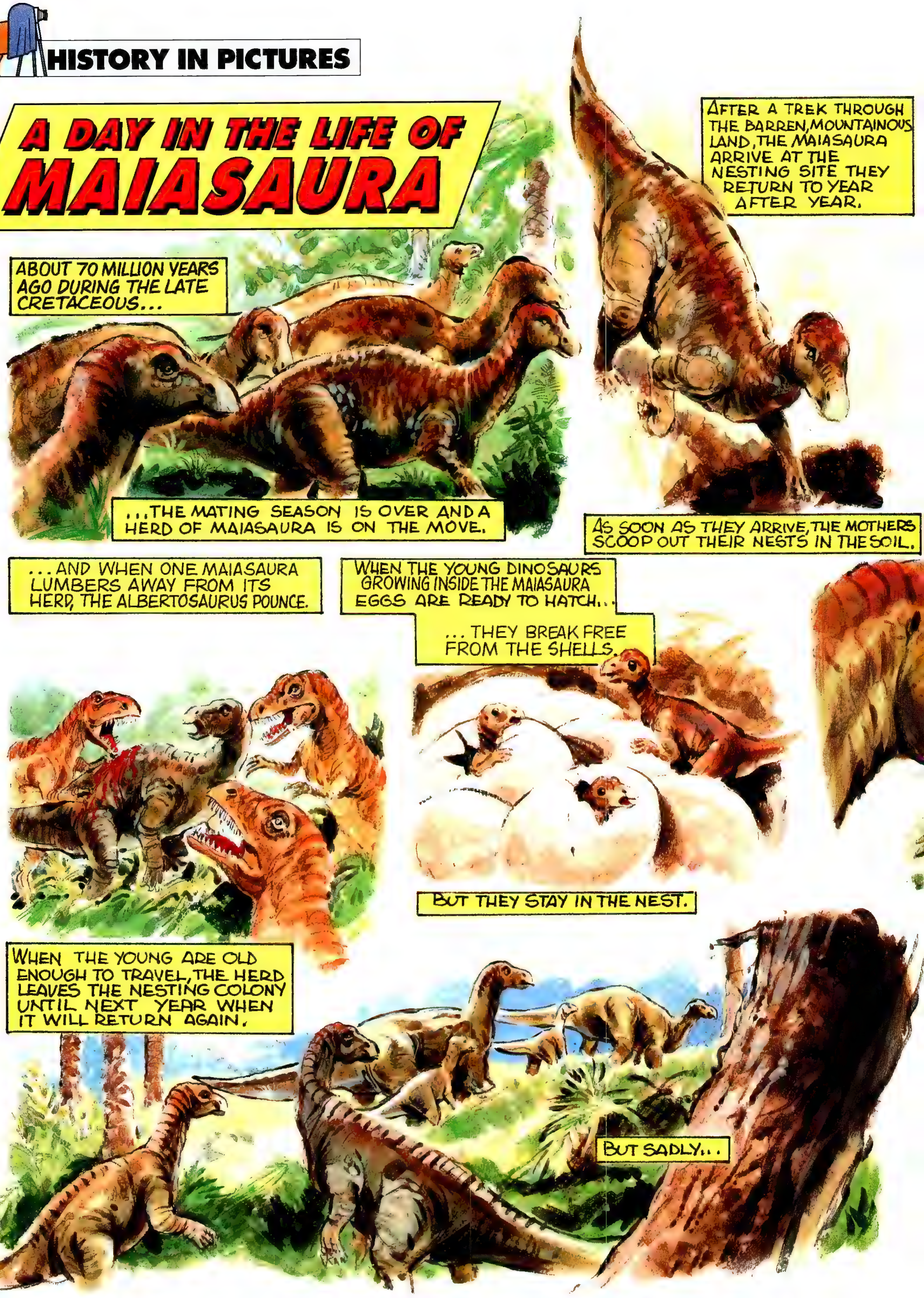
Today's Exmoor ponies (above) are believed to have changed very little since prehistoric times. They are the oldest breed of horse in Britain.

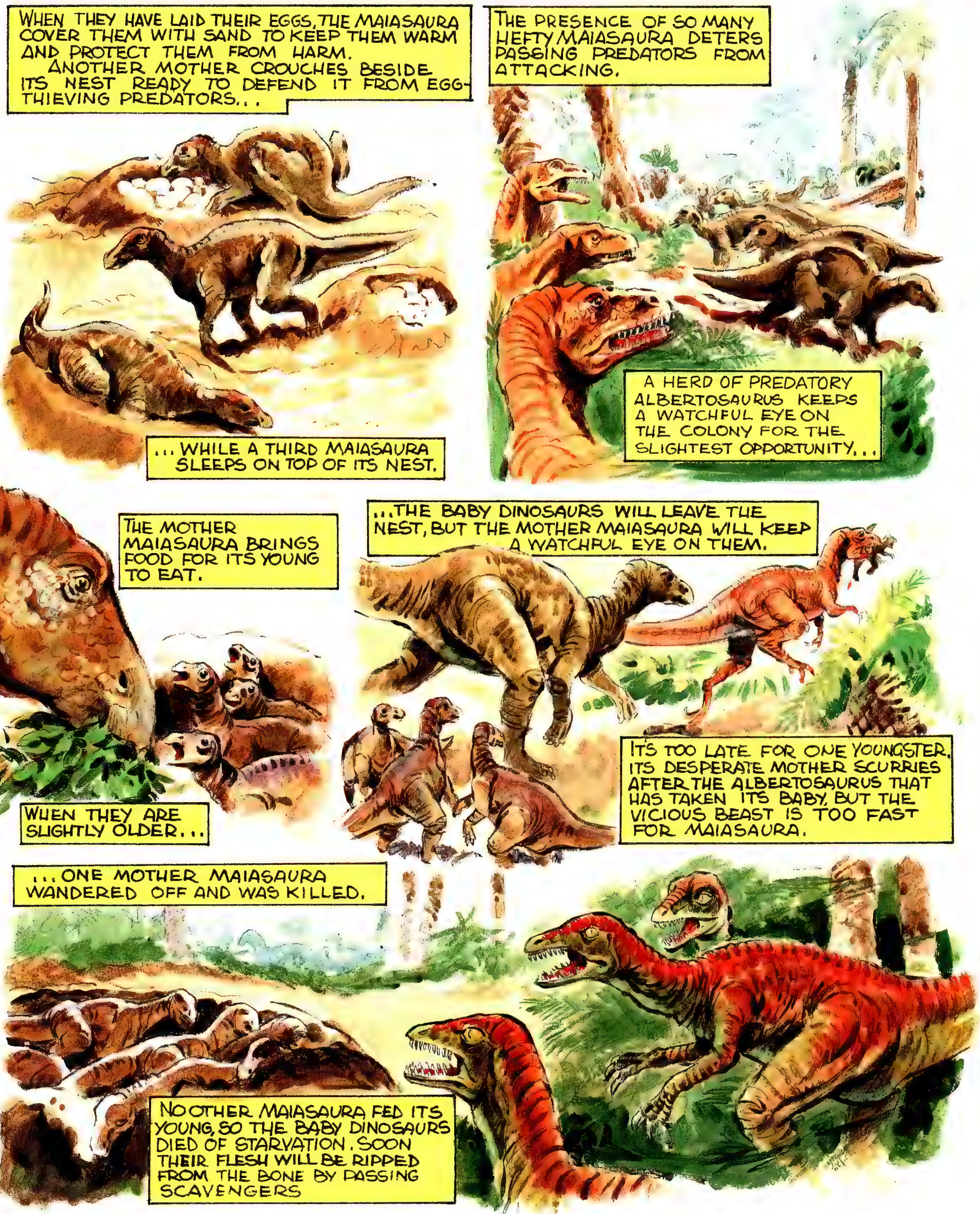


EQUUS CHECKLIST

- ARRIVED 2 MILLION YEARS AGO
- HEIGHT 1.5M
- ALL TOES GROUPED INTO A HOOF

A DAY IN THE LIFE OF MAIASAURA


ABOUT 70 MILLION YEARS AGO DURING THE LATE CRETACEOUS...
...THE MATING SEASON IS OVER AND A HERD OF MAIASAURA IS ON THE MOVE.
AFTER A TREK THROUGH THE BARREN, MOUNTAINOUS LAND, THE MAIASAURA ARRIVE AT THE NESTING SITE THEY RETURN TO YEAR AFTER YEAR.
AS SOON AS THEY ARRIVE, THE MOTHERS SCOOP OUT THEIR NESTS IN THE SOIL.
...AND WHEN ONE MAIASAURA LUMBERS AWAY FROM ITS HERD, THE ALBERTOSAURUS POUNCE.
WHEN THE YOUNG DINOSAURS GROWING INSIDE THE MAIASAURA EGGS ARE READY TO HATCH...
...THEY BREAK FREE FROM THE SHELLS.
BUT THEY STAY IN THE NEST.
WHEN THE YOUNG ARE OLD ENOUGH TO TRAVEL, THE HERD LEAVES THE NESTING COLONY UNTIL NEXT YEAR WHEN IT WILL RETURN AGAIN.
BUT SADLY...


WHEN THEY HAVE LAID THEIR EGGS, THE MAIASAURA COVER THEM WITH SAND TO KEEP THEM WARM AND PROTECT THEM FROM HARM.
ANOTHER MOTHER CROUCHES BESIDE ITS NEST READY TO DEFEND IT FROM EGG-THIEVING PREDATORS...
...WHILE A THIRD MAIASAURA SLEEPS ON TOP OF ITS NEST.
THE PRESENCE OF SO MANY HEFTY MAIASAURA DETERS PASSING PREDATORS FROM ATTACKING.
A HERD OF PREDATORY ALBERTOSAURUS KEEPS A WATCHFUL EYE ON THE COLONY FOR THE SLIGHTEST OPPORTUNITY...
THE MOTHER MAIASAURA BRINGS FOOD FOR ITS YOUNG TO EAT.
WHEN THEY ARE SLIGHTLY OLDER...
...THE BABY DINOSAURS WILL LEAVE THE NEST, BUT THE MOTHER MAIASAURA WILL KEEP A WATCHFUL EYE ON THEM.
IT'S TOO LATE FOR ONE YOUNGSTER. ITS DESPERATE MOTHER SCURRIES AFTER THE ALBERTOSAURUS THAT HAS TAKEN ITS BABY, BUT THE VICIOUS BEAST IS TOO FAST FOR MAIASAURA.
...ONE MOTHER MAIASAURA WANDERED OFF AND WAS KILLED.
NO OTHER MAIASAURA FED ITS YOUNG, SO THE BABY DINOSAURS DIED OF STARVATION. SOON THEIR FLESH WILL BE RIPPED FROM THE BONE BY PASSING SCAVENGERS

Improve and test your knowledge with...

FACT FILE

Work your way along *Dimetrodon's* sail, answering the questions as you go.

Prehistoric comic!

Did you know that a dinosaur was the first character to be designed especially for an animated cartoon? An Apatosaurus was used as a model for the cartoon character 'Gertie the Dinosaur' in 1912. So dinosaurs were popular even then, although Gertie looked very different from the dinosaurs in 'Jurassic Park'!

Egg-citing!

The University Museum in Oxford, England, now has two Mongolian dinosaur eggs. The eggs were found in the Gobi Desert and are thought to have belonged to a sauropod, like Diplodocus. They measure over 13cm in diameter and are probably 120 million years old!

1 What kind of creature was *Cynognathus*?

a) a mammal
b) a reptile
c) a dinosaur

2 *Yangchuanosaurus* weighed as much as:

a) a fox
b) a giraffe
c) a rhinoceros

3 A fossil skeleton of *Xiphactinus* revealed:

a) it was a cannibal
b) it had two heads
c) it lived on land

4 *Phororhacos* was:

a) a fat fish
b) a tiny insect
c) a giant flightless bird

5 Prehistoric mammal *Patriofelis* looked like:

a) a modern rabbit
b) a modern deer
c) a modern leopard

Flying mammals

Prehistoric bats were up in the air 50 million years ago. Bats are the only mammals to fly rather than walk, run or glide. The earliest known bat is Icaronycteris.

6 Darwin wrote about:

a) cooking
b) evolution
c) teeth

7 How many toes did *Hyracotherium* have on each foot?

a) five
b) four
c) three

8 Mammals have three types of teeth – incisors, canines and:

a) moles
b) molars
c) molasses

9 *Palaeocastor* was a rodent and looked quite like:

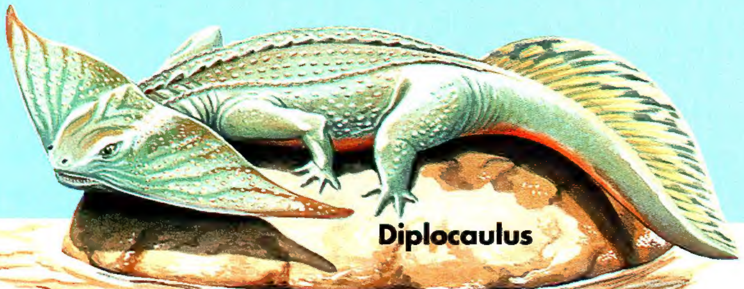
a) a dog
b) a human
c) a beaver

10 The quickest plant-eating dinosaur may have been:

a) *Seismosaurus*
b) *Triceratops*
c) *Anatotitan*

Napoleon's hat

Diplocaulus was a small reptile which lived in ponds over 250 million years ago. It was about 60cm long, with a skull that widened into a strange 'head-shield' in the shape of the hat worn by Napoleon Bonaparte! The shield may have helped Diplocaulus adjust its height in the water while swimming.


Diplocaulus

Dating fossils

Radioactivity helps experts to learn about dinosaurs and other prehistoric animals. Radioactive elements in a rock slowly change into other elements. By studying this change, scientists can tell the age of a rock and therefore the age of the fossils embedded in it.

Answers on inside back cover

TITANOSAURUS **80 MYA**

Titanosaurus (tie-tan-oh-saw-rus) was first found in India more than 100 years ago. Fossils have since been discovered in Hungary and Argentina. *Titanosaurus* was a large plant-eater and as long as the net across a tennis court. *Titanosaurus* used its clawed hands and whiplash tail to protect itself from predators. Like *Saltasaurus,* it probably had bony plates across its broad back. *Titanosaurus* raked leaves from the top of tall trees with peg-like teeth. It was named 'titanic reptile' after the Titans of Greek mythology, who ruled the universe.

TOROSAURUS **70 MYA**

Torosaurus (tor-oh-saw-rus) had the biggest head of any known land animal. Its skull was as long as a small car and it had a magnificent frill which stood up as it lowered its head. *Torosaurus* had large, pointed horns above each eye and a smaller horn at the end of its snout. Its name means 'bull reptile'. Plant-eating *Torosaurus* may have used its brow horns to wrestle with rivals in its herd. It weighed more than five rhinoceroses and walked on four thick, sturdy legs as it looked for low-growing vegetation to eat.

TORVOSAURUS **145 MYA**

Huge, flesh-eating *Torvosaurus* (tor-voh-saw-rus) lived in the Late Jurassic Period in Colorado, USA. It was longer than a bus and as heavy as an elephant. It moved on two powerful legs and used its short arms and ferocious claws to tear the flesh of its prey.

Torvosaurus means 'savage reptile'.

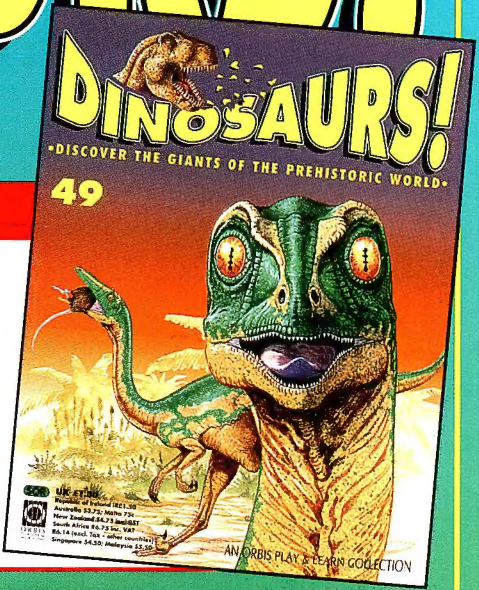
TRICERATOPS **70 MYA**

Triceratops (try-serra-tops) was a plant-eater. Longer than two cars, it had three horns on its head. Its nose horn was short, but the brow horns above each eye grew up to 1m long. A bony frill protected *Triceratops'* shoulders from head-on attack by its enemies. Experts think it could probably charge at other dinosaurs at speeds of up to 35km/h. Its name means 'three-horned face'.

MYA = MILLION YEARS AGO

COMING IN PART 49 OF

DINOSAURS!


DINOSAURS!
•DISCOVER THE GIANTS OF THE PREHISTORIC WORLD•
49
AN ORBIS PLAY & LEARN COLLECTION

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THE DINOSAURS! POSTER COLLECTION

Have you ever wanted to fill your room with dinosaurs? Now you have your chance – with the *Dinosaurs!* POSTER COLLECTION. Each poster is 820 x 570mm (nearly eight times the size of this page) and features a superb dinosaur artwork. You'll find facts and figures about the dinosaur on the back – PLUS a look at some other prehistoric animals. The 14th poster is *Stegosaurus*.

PICTURE CREDITS: Front cover: Graham Rosewarne. Natural History Museum, London: IFC, 1130; NHPA 1137 B, 1143 TR, 1144 T,BR, 1147 TR; Oxford Scientific Films 1145 B, Planet Earth 1136 C; Science Photo Library 1145 T.

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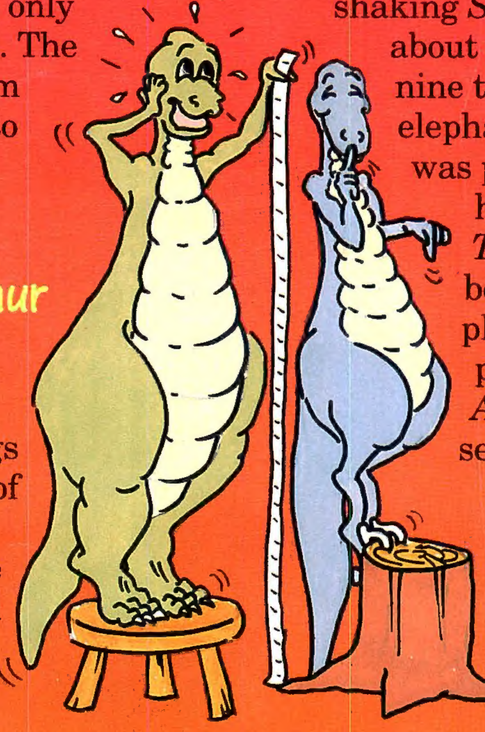
ANSWERS TO FACT FILE QUESTIONS: 1.b 2.c 3.a 4.c 5.c 6.b 7.b 8.b 9.c 10.c

Dr. David Norman of Cambridge University answers your dinosaur questions

ASK THE EXPERT

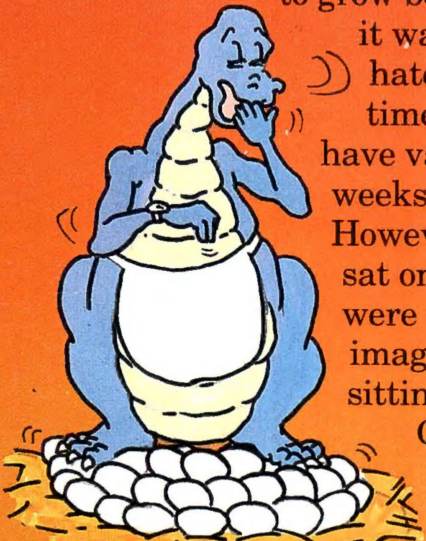
Was Velociraptor taller than a man?

In the film 'Jurassic Park', the creatures called 'raptors' were definitely bigger than humans. But don't confuse them with *Velociraptor* which was only 2m long and about 1.5m tall. The creatures featured in the film were actually more similar to *Deinonychus* in their size and proportions.



How long would a dinosaur have sat on its eggs?

It's rather like asking how long do birds sit on their eggs – it all depends on the type of dinosaur and the size of its eggs. The larger the egg, the longer the youngster needed to grow before it was hatching time. So incubation may have varied from a few weeks to several months. However, not all dinosaurs sat on their eggs. Some were too heavy – can you imagine a brachiosaur sitting on top of its eggs?! Other dinosaur eggs may have been kept warm by rotten vegetation built into the nest.



Which dinosaur was king of the plant-eaters?

It depends what you mean by 'king'. The largest-known plant-eater is Earth-shaking *Seismosaurus,* which was about 36m long and weighed up to nine times as much as an African elephant! The most efficient eater was probably *Triceratops.* With its huge, powerful jaws, *Triceratops* may also have been the eater of the toughest plant food. But the quickest plant-eater may have been *Anatotitan,* with its stunning set of grinding teeth.

Did dinosaurs guard their patch jealously?

Some dinosaurs may well have been territorial, especially at mating time. Dinosaurs with horns, frills or crests on their heads would have displayed them. In this way they were similar to modern deer and antelopes which also become territorial during the 'rutting' or mating season. It's hard to tell if dinosaurs with no signalling devices, like horns or frills, were territorial but the answer is probably yes.

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